

---

# New Species and Notes in the Genus *Dioclea* s.l. (Fabaceae, subtribe Diocleinae)

Richard H. Maxwell

Indiana University Southeast Herbarium (JEF), 4201 Grant Line Road, New Albany, Indiana  
47150, U.S.A. rmaxwell@ius.edu

---

**ABSTRACT.** Seven new species are described in *Dioclea* Kunth (Fabaceae, Diocleinae). *Dioclea ovalis* R. H. Maxwell is described from Colombia and assigned to series *Dioclea*. Within subgenus *Dioclea*, the new series *Virgatae* R. H. Maxwell is created, with the new species *D. vallensis* R. H. Maxwell included from Colombia. Two sections established by Bentham are raised to subgenera status, as the new combinations *Dioclea* subg. *Pachylobium* (Benth.) R. H. Maxwell and *Dioclea* subg. *Platylobium* (Benth.) R. H. Maxwell. Within subgenus *Platylobium*, *D. hispidimarginata* R. H. Maxwell is described from Peru. Within subgenus *Pachylobium*, four new species are described: *D. apiculata* R. H. Maxwell from Bolivia, *D. circinata* R. H. Maxwell from Colombia, *D. haughtii* R. H. Maxwell from Colombia and Venezuela, and *D. jamesonii* R. H. Maxwell from Ecuador. *Dioclea macrocarpa* Huber is designated as lectotype for *Dioclea* sect. *Macrocarpon* Amshoff.

**Key words:** *Dioclea*, Diocleinae, Fabaceae.

Bentham (1837) divided *Dioclea* Kunth (Fabaceae, Diocleinae) into section *Eudioclea* Benth. and section *Pachylobium* Benth. and described 11 new species. Bentham (1859) later added one new species, and new collections with fruit enabled him to segregate a third section, section *Platylobium* Benth. To separate his three sections, Bentham (1837, 1839) used differences in stipule size, whether stipules extend below insertion (produced); alternate anther size, as smaller (effoetae) or uniform; the number of ovules; and legume shape, number of seeds, and hilum shape and length relative to the seed size. I am, in general, following Bentham's selection of section characters in raising sections to subgenera, and the two combinations *Dioclea* subg. *Platylobium* (Benth.) R. H. Maxwell and *Dioclea* subg. *Pachylobium* (Benth.) R. H. Maxwell are established. Amshoff (1939) named a new section, section *Macrocarpon* Amshoff, containing *D. huberi* Ducke and *D. macrocarpa* Huber, two species with uniform anthers and several seeds evenly distributed in the fruit. These characters did not fit into Bentham's section *Platylobium*. New species, series, sections, and subgenera herein

represent some originally cited in my doctoral dissertation (Maxwell, 1969).

Lackey (1981), in his key, split *Dioclea* into two groups: (1) *Dioclea* sect. *Dioclea* and (2) *Dioclea* sect. *Pachylobium* and *Dioclea* sect. *Platylobium*. Pollen evidence (Kavanagh & Ferguson, 1981) strengthens the independence of these two subgroups. Furthermore, two articles (Maxwell & Taylor, 2003; Queiroz et al., 2003) show the existence of separate clades of species in *Dioclea*. Species within *Dioclea* (operational taxonomic units [OTUs]) were selected in Maxwell and Taylor (2003) to represent the three subgenera and the sections or series in Maxwell (1969). Maxwell and Taylor (2003) stated that the data clearly show the existence of two separate clades of species in *Dioclea*. Queiroz et al. (2003) found a *Pachylobium* clade and a *Cymbosema* Benth.–*Dioclea* clade, with *Dioclea* species in the latter all within *Dioclea* sect. *Dioclea* and distinct from the *Pachylobium* clade. I assert that the *Dioclea* species in the *Cymbosema*–*Dioclea* clade (Queiroz et al., 2003) and *Dioclea* subg. *Dioclea* (Maxwell & Taylor, 2003) represent a distinct genus.

Varela et al. (2004: 61), using spacer sequences from nuclear ribosomal DNA, found the “region sequences are congruent with the morphologically defined subgenera (Maxwell, 1969, unpublished Ph.D. dissertation), being well supported by high bootstrap values.”

Taylor, Queiroz, and Maxwell have agreed to collaborate to define or redefine the status of species groups within *Dioclea* s.l. DNA analysis of *Dioclea* species is ongoing at Indiana University Southeast, and the results will be incorporated with other available data. We are aware of the genus *Platylobium* Sm. (Smith, 1793), and if *Dioclea* subg. *Platylobium* is ultimately raised to genus level, a new name will be chosen.

*Dioclea* is a group of ca. 60 species centered primarily in the New World tropics. However, *D. reflexa* Hook. f. (= *D. hexandra* (Roxb.) Mabb.), described from West Africa, as well as *D. wilsonii* Standl., from Central America, contribute sea beans, which are components of oceanic drift found on many



Old and New World islands (Muir, 1937; Gunn, 1968; Gunn et al., 1976).

I have substituted the term brachyblast for tubercle, or short shoot, the outgrowth from the inflorescence upon which *Dioclea* flowers develop. Floral bracts are first-order innovations at the base of the brachyblast, bractlets are second-order at the base of the flower pedicels, and bracteoles are third-order bracts paired at the base of the flower calyces (Tucker, 1987). I also rely heavily on fruit and seed characters, when these are known, as suggested by Corner (1951).

**Dioclea** Kunth, Nov. Gen. Sp. [H.B.K.] 6: 342 (folio ed.). [12 July] 1824 [quarto ed.: 6(29): 437. Sep. 1824]. TYPE: *Dioclea sericea* Kunth (lectotype, designated by Britton & Wilson [1924: 418]).

*Dioclea* Spreng., Syst. Veg. (ed. 16) [Sprengel] 1: 502, 556. 1824 [1825], nom. illeg. superfl. TYPE: *Dioclea hispidissima* (Lehm.) Spreng. [Boraginaceae].

*Hymenospron* Spreng., Syst. Veg. (ed. 16) [Sprengel] 4: 283. 1827. TYPE: *Hymenospron apurense* Spreng. (= *Dioclea apurensis* Kunth; = *Hymenospron sericeum* Spreng. [= *Dioclea sericea* Kunth]).

*Crepidotropis* Walp., Linnaea 14: 296. 1840. TYPE: *Crepidotropis brasiliensis* Walp.

*Lepidamphora* Zoll. ex Miq., Fl. Ned. Ind. 1(1): 217. 1855. TYPE: *Lepidamphora volubilis* Zoll., nom. inval., sine Latin diagnosis [= *Dioclea javanica* Benth.].

**I. *Dioclea* subg. *Dioclea* Kunth, Nov. Gen. Sp. [H.B.K.] 6(28): 342 (folio ed.). [12 July] 1824 [quarto ed.: 6(29): 437. Sep. 1824]. *Dioclea* sect. *Eudiocelea* Benth., Comm. Legum. Gen. 2: 69. 1837. TYPE: *Dioclea sericea* Kunth (lectotype, designated by Britton & Wilson [1924: 418]).**

Woody vines, trailing, climbing, or becoming shrubby in open habitat. Leaves trifoliolate, leaflets with primary lateral veins in 5 to 8 pairs; stipules ovate, lanceolate, not produced, to ca. 4 mm. Inflorescences axillary, pseudoracemose; floral bracts to ca. 4 mm; bracteoles variable, smaller, mostly ovate, oval to lanceolate 1.5–7 × 1–4 mm, or larger oval to suborbicular, 6–15 × 6–10 mm. Flowers 1.3–5.5 cm, petals membranous; calyx 4-lobed, the upper lobe apex entire; standard ecallose, apex margin puberulent, with basal, collarlike auricles usually extending down the claw; wings obliquely oblong, oblanceolate to obovate, frequently with a spur, usually puberulent, smaller or equal to the keel petals; keel petals obliquely oblong to somewhat rectangular or oblong, erostrate, the upper margin with fimbriate, dentate, or serrate sections, rarely entire, glabrous; stamens 10, glabrous, mostly pseudomonadelphous, very rarely the vexillary free;

anthers 10, monomorphic; pistil geniculate, or distally ascending, exerted, ovary 5- to 15-ovulate, ovary disc mostly entire (disc collar), style glabrous distally, stigma terminal, capitate, small. Fruit flat, dry, linear to oblong, dehiscent, upper margin mostly straight, upper suture with a closely parallel rib or wing to each side, without extra wings or ribs, the lower margin naviculate, lower suture indistinct or swollen (flanged); seeds small, somewhat oblong to elliptic, flat, hard, smooth, 7–14 × 4–8.5 × 2–3 mm, hilum linear, ca. 7–14 mm, encircling nearly 1/2 the circumference of the seed.

*Discussion.* Two species were described by Kunth, *Dioclea apurensis* and *D. sericea*. *Dioclea apurensis* (syntype, P-Bonpl.) has fruit but lacks flowers. Both species exhibit characters that place them in Bentham's section *Eudiocelea*. Bentham (1837) characterized his section *Eudiocelea* by obtuse, beakless keel petals; wing petals smaller than or equal in length to the keel petals; upper suture of the legume narrowly two-winged; stipules ovate-lanceolate, small, and not produced below insertion; and uniform anthers. These characters are still valid and are incorporated in the subgenus description above.

***Dioclea* Kunth sect. *Dioclea*.**

**Ia. *Dioclea* Kunth ser. *Dioclea*.**

Bracteoles small, mostly ovate, ca. 1.5–2.5 × 0.5–3 mm (except lanceolate, to ca. 7 × 4 mm in the new species *Dioclea ovalis*); flowers mostly 1.5–2.5 cm (except 30–35 mm in *D. albiflora* R. S. Cowan); pedicels mostly < 5 mm (except ca. 7 mm in *D. albiflora*); standards reflexed; calyx pubescent (except somewhat substrigose in *D. albiflora*); pistils with ovary, proximal portions of the style mostly straight, distally ascending; fruit usually < 2 cm wide.

**1. *Dioclea ovalis* R. H. Maxwell, sp. nov.** TYPE: Colombia. Cundinamarca: Pacho, Hac. Patasía, 1800–2000 m, 8 Feb. 1948, L. U. Uribe 1648 (holotype, US; isotype, COL). Figure 1.

Haec species a congeneris *Diocleae* Kunth subg. *Diocleae* sect. *Diocleae* ser. *Diocleae* bracteolis lanceolatis usque ad 7 × 3.5 mm distinguitur.

Climbing vine or subshrub, stems terete, with sparse, canescent to tomentose pubescence. Leaves with leaflets broadly oval to suborbicular, terminal leaflets to ca. 11 × 7.5 cm, lateral leaflets to ca. 9.5 × 6.5 cm, adaxial lamina surface tomentulose, abaxial surface curly villous, with a nigrescent reticulum, apices obtuse, bases round, primary lateral veins in



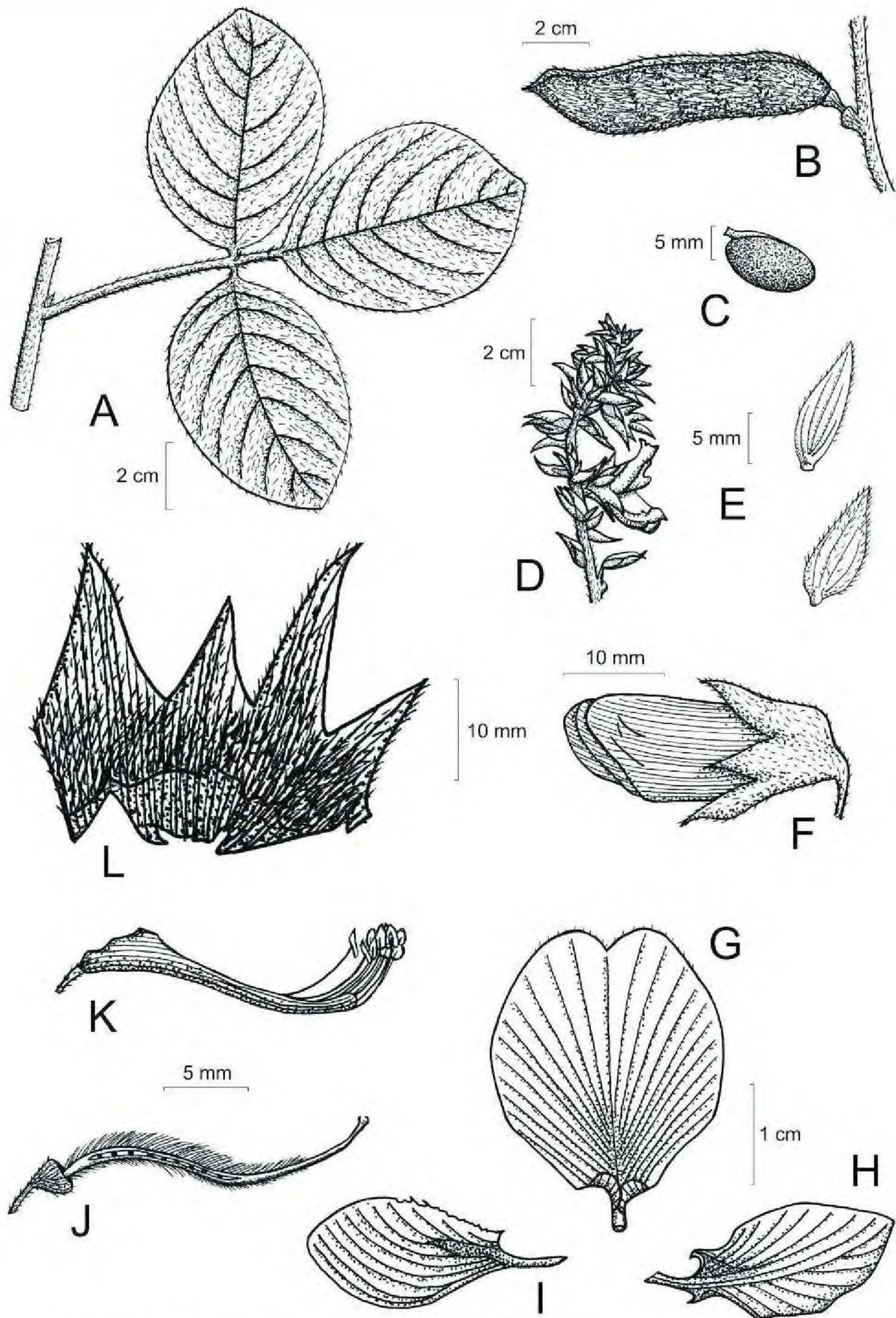


Figure 1. *Dioclea ovalis* R. H. Maxwell. —A. Habit with leaf and portion of stem. —B. Fruit. —C. Seed. —D. Inflorescence, top portion. —E. Bracteoles, internally glabrous (top), externally fuscous villous (bottom). —F. Flower bud. —G. Standard. —H. Wing petal. —I. Keel petal. —J. Gynoecium. —K. Androecium. —L. Calyx, inner surface with fuscous villous indument. A–L drawn from the holotype *L. U. Uribe 1648* (US).



ca. 8 pairs; petioles and rachis canaliculate, petiole ca. 5.5 cm, rachis ca. 5 mm, light fuscous tomentose; stipules triangular, ca.  $4 \times 2$  mm, villous outside, glabrous inside, persistent; stipels setiform, ca. 1.5 mm, ciliate, persistent. Inflorescences axillary or terminal, single, unbranched, ca. 50 cm, terete below, ridged above, stout, light fuscous tomentose; florule 1/3–2/3 the length; brachyblasts sessile; floral bracts triangular, ca.  $2.5 \times 1.5$  mm, strigose outside, glabrous inside, persistent; bracteoles ovate to lanceolate, to ca.  $7 \times 2.5$ – $3.5$  mm, fuscous, subvillous outside, glabrous inside, caducous; bractlets ca.  $3 \times 2$  mm, subvillous outside, glabrous inside; pedicels ca. 4 mm. Flowers to 2.7 cm, buds acuminate; calyx tube ca. 7 mm, light fuscous villous pubescence outside, fuscous villous inside, lobes lanceolate, upper lobe entire,  $8$ – $11 \times$  ca. 8 mm basally, lateral lobes ca.  $7 \times 5$  mm, lower lobe ca.  $11 \times 5$  mm; petals membranous; standard reflexed, purple, broadly ovate, ca.  $27 \times 23$  mm, apex emarginate, puberulent, ecallose, basally biauriculate, claw ca. 4 mm; wings broadly oblanceolate-elliptic, ca.  $20 \times 12$  mm, apex puberulent, spur and auricle sharp, downcurved, claw ca. 5 mm; keel petals obliquely oblong, ca.  $19 \times 10$  mm, weakly auriculate to exauriculate, upper margin serrate basally, with deeper incisions medially, diminishing in depth distally, claw ca. 5 mm; stamens pseudomonadelphous, glabrous, anthers 10, uniform, vexillary filament free basally ca. 3.5 mm, lightly joined to the sheath; pistil ca. 18 mm, distally ascending, style glabrous ca. 6 mm distally; ovary ca. 9 mm, ca. 9-ovulate, villous, with a disc collar. Fruit compressed, oblong, ca.  $9 \times 2 \times 0.5$  cm, dehiscent, exocarp with persistent, ferruginous pubescence, pedicel attached toward the base, upper suture with thin wings ca. 3 mm to either side, lower margin slightly swollen, ca. 7-seeded; seeds somewhat elliptic, ca.  $11 \times 7 \times 3$  mm, red-brown, sparsely mottled, hilum ca. 10 mm.

*Distribution and habitat.* This species is found at altitudes between 1200 and 2000 m, climbing on riverbanks and the sides of ravines in Colombia.

*Discussion.* *Dioclea ovalis* is named for the oval shape of the leaflets. *Dioclea ovalis* specimens may be found among those determined as *D. lehmannii* Diels and *D. guianensis* Benth. var. *velutina* Benth. *Dioclea lehmannii* (type, *Lehmann 5754* [believed destroyed at B]; isotypes, F, US) is distributed at low altitudes in the coastal plain swamps and lower rainforest of Ecuador (Svenson, 1946: 420). *Dioclea guianensis* var. *velutina* (type, *Hinds s.n.*, K), from Puná Island, Guayaquil, Ecuador, shares a dark calyx tube with somewhat ferruginous pubescence, cadu-

cous lanceolate bracteoles, and long acuminate calyx lobes. *Dioclea ovalis* is considered a high-altitude species of the series with the longest lanceolate bracteoles. A reexamination of the isotype of *D. lehmannii* at F enabled me to recognize *D. ovalis* as a new species (Maxwell, 1969: 414–418).

*Paratypes.* COLOMBIA. **Cundinamarca:** Pandi, 8 Feb. 1876, *E. André 1497* (NY); Sasaima, *Bro. Estanislao 71* (US); Pacho, Río Patasía, 26 May 1947, *L. U. Uribe 1567* (COL); Cumaca, Calandaima, Laguna de la Cajita, *L. U. Uribe 5036* (COL).

**Ib. *Dioclea* ser. *Virgatae*** R. H. Maxwell, ser. nov.  
TYPE: *Dioclea virgata* (Rich.) Amshoff, *Meded. Bot. Mus. Herb. Rijks Univ. Utrecht* 52: 69. 1939. [= *Dolichos virgatus* Rich., *Actes Soc. Hist. Nat. Paris* 1: 111. 1792.]

Haec series a ceteris seriebus *Diocleae* Kunth subg. *Diocleae* floribus (2–)2.5–5.5 cm longis, pedicellis plerumque > 5 mm longis (praeter illos in *D. apurensis* Kunth), vexillo reflexo vel patente, calyce plerumque glabro atque ovario proximaliter recto deorsum curvato deinde geniculato vel sigmoidali distinguitur.

Bracteoles large, broadly elliptic to suborbicular (except ca.  $3.5 \times 3$  mm in *Dioclea burkartii* R. H. Maxwell and *D. apurensis*; ca.  $8 \times 3$  mm, lanceolate-elliptic in *D. fimbriata* Huber); flowers (2–)2.5–5.5 cm, pedicels mostly > 5 mm (except *D. apurensis*); standards reflexed (except spreading in the ornithophilous species *D. fimbriata* and *D. macrantha* Huber [Queiroz et al., 2003: 317]); calyx glabrous (except occasionally strigose in *D. apurensis* and the novel *D. virgata* var. *crenata* R. H. Maxwell); pistils with ovary, proximal portions straight, mostly downcurved then geniculate, occasionally somewhat sigmoidal; fruit large (for section), mostly 2–2.5(–3) cm wide.

**1. *Dioclea vallensis*** R. H. Maxwell, sp. nov. TYPE: Colombia. Valle del Cauca: Pacific coast, Río Cajambre, 5–80 m, 5–15 May 1944, *J. Cuatrecasas 17499* (holotype, US; isotype, F). Figure 2.

Haec species *Diocleae virgatae* (Rich.) Amshoff magnitudine bracteolarum similis, sed ab ea foliolis membranaceis vel papyraceis apice longe acuminatis, carinae margine superiore serrulato integrove (nec fimbriato) et fructu 2–3 cm lato differt.

Vines, twining, high climbing, stems terete, with sparse upcurved white hairs or glabrate. Leaves with leaflets membranous or papyraceous, ovate, terminal leaflets frequently broadly ovate,  $8$ – $14.5 \times 4.5$ – $7.5$  cm, lateral leaflets  $7$ – $11 \times 4$ – $7$  cm, slightly



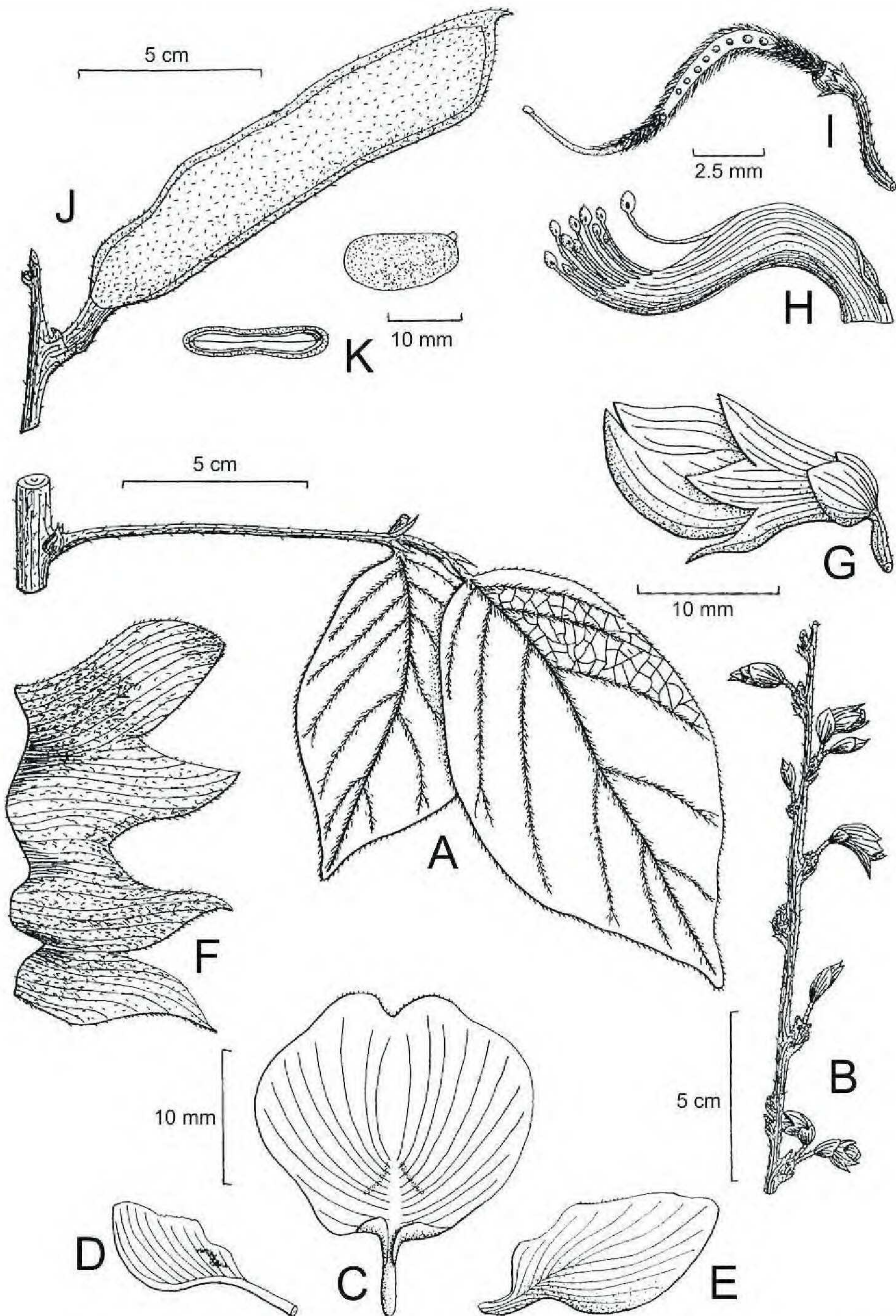


Figure 2. *Dioclea vallensis* R. H. Maxwell. —A. Habit with terminal and lateral leaflets, with one lateral leaflet removed. —B. Portion of inflorescence. —C. Standard. —D. Keel petal. —E. Wing petal. —F. Calyx, inner surface (to same scale as C–E). —G. Flower bud. —H. Androecium. —I. Gynoecium. —J. Fruit. —K. Seeds, hilum view (at left) and side view (at right). A–J drawn from the holotype *Cuatrecasas 17499* (US); K from *Cuatrecasas 15257* (US [sheet 2]).



asymmetrical, apices acuminate with drip tips to 1.5 cm, bases rounded, occasionally narrowly truncate or slightly cordate, adaxial lamina surface glabrate except the primary veins, abaxial surface sparsely pubescent with erect, curved, canescent pubescence, primary lateral veins in 5 to 7 pairs; petiole and rachis slender, with sparse strigose pubescence, petioles to ca. 10 cm, rachis 8–16 mm; stipules not produced below insertion, acute or triangular, to 3 mm; stipels setiform, to 4 mm, glabrous, persistent. Inflorescences axillary, single or double, unbranched, 30–65 cm, terete, with short, ascending, curly, canescent pubescence, floriate ca. 1/2 the length; brachyblasts sessile, somewhat blocky-elongate; floral bracts acute or ovate, ca. 2.5 mm, glabrate, persistent; bracteoles ovate, ca. 6–10 × 6–8 mm, semi-persistent or persistent, glabrous or sparsely puberulent; pedicels to ca. 6 mm. Flowers to ca. 2.3 cm; calyx tube ca. 8 mm, glabrate, occasionally pubescent along the median ridges, upper lobe obtuse, ca. 7 mm, entire, lateral lobes acute, ca. 6 mm, lower lobe lanceolate, ca. 7 mm; standard reflexed, lilac, purple, or violet, with the lamina obovate or orbicular, emarginate, apex puberulent, to ca. 18 × 19 mm, claw ca. 6 mm; wings somewhat obliquely oblong, to ca. 15 × 8 mm, auricle blunt, without a spur, claw ca. 5 mm; keel petals blocky, oblong to somewhat obliquely oblong, ca. 9 × 6 mm, claw ca. 5 mm, upper median margin mostly shallowly serrate, occasionally entire; stamens 10, glabrous, vexillary filament free at the base ca. 4 mm, pseudomonadelphous, or vexillary occasionally completely free, anthers 10, perfect; pistil gently downcurved with an ascending style, or sigmoidal, style proximally bearded, distally glabrous ca. 4 mm; stigma terminal, capitate; ovary ca. 7 mm, with a basal disc collar, ca. 8-ovulate, with whitish tomentose pubescence < 1 mm. Fruit flat, oblong, pedicel attachment at the lower margin, to ca. 12 × 2–3 × 0.4 cm, eventually dehiscent, with stiff, erect, canescent pubescence changing to ferruginous, fugacious, then glabrate; upper suture paralleled by a wing ca. 2.5 mm to either side, lower margin flanged, 5- to 9-seeded; seeds smooth, shining, hard, dark brown, occasionally with darker mottling, ca. 14 × 8.5 × 2.5 mm, hilum ca. 14 mm, encircling nearly 1/2 the circumference of the seed.

*Distribution, habitat, and phenology.* This species is found in swampy forests, woods, wooded cliffs, and valleys along rivers. *Dioclea vallensis* has been collected in Chocó and Valle del Cauca departments, Colombia, west of the Cordillera Occidental, at low altitudes from just above the high tide mark along the

Pacific coast up to 250 m; it flowers from October to May.

*Discussion.* *Dioclea vallensis* is named after its geographic location and shares similar characters of the series with the common *D. virgata*. However, *D. virgata* possesses flowers with a purple splotch above the yellow target area of the reflexed standard and keel petals with the upper mid-margin fimbriate.

*Dioclea vallensis*, *D. virgata* var. *crenata*, and *D. apurensis* possess upper keel petal margins with a few shallow crenate or dentate teeth. *Dioclea apurensis* has the smallest bracteoles (ca. 3 × 3 mm) and flower pedicels (ca. 3 mm long). Other species in series *Virgatae* include: *D. burkartii* from Argentina, southern Brazil, and Paraguay; *D. fimbriata* along the lower Amazon; *D. macrantha* from northern Amazonia, from the Guianas; and *D. virgata* from Amazonia and the Guianas into eastern South America, Central America, and Mexico, and south along the Andes to Bolivia.

Zamora (2000) places the monotypic *Cymbosema roseum* Benth. into *Dioclea* [= *Dioclea rosea* (Benth.) N. Zamora]. Queiroz et al. (2003: 317) indicated that “[t]his proposition has low bootstrap support in the present study (0.17) and the relationship of *Cymbosema* was sensitive to the type of analysis performed, which suggests that more data are needed to resolve its taxonomic placement.” Placement of *D. macrantha* next to *C. roseum* occurred in Maxwell and Taylor’s treatment (2003). These species in series *Virgatae*, *D. macrantha* and *D. fimbriata*, have long, pink to reddish flowers, rather than violet to purple; the standards spreading, rather than reflexed; and may represent different floral pollination syndromes, possibly ornithophilous, while the rest of the series *Virgatae* and subgenera have been noted as melittophilous (Queiroz et al., 2003: 305, 317). Varela et al. (2004: 65, 66) showed the close molecular sequence relationship of *C. roseum* to *D. guianensis* and *D. virgata* as a sister taxon of subgenus *Dioclea*, within the *Dioclea* clade. *Cymbosema roseum* has a pubescent calyx, small ovate bracteoles, a free vexillary stamen, a ca. 6-ovulate ovary, oblong fruit that is somewhat falcate, without ribs or wings parallel to the upper suture, ca. 4.4–6 × 1.8–2.2 × 0.4–0.7 cm, with a downcurved beak, and two to five seeds (Maxwell, 1970, 1999; Kirkbride et al., 2003).

*Paratypes.* COLOMBIA. **Chocó:** Río San Juan, *J. Cuatrecasas* 21380 (F); Docordó, N mouth of Río San Juan, *A. Gentry, E. Zardini, M. Monsalve & J. D. Caicedo* 53845 (JEF, MO). **Valle del Cauca:** Dept. del Valle, along Río Anchicayá, *J. Cuatrecasas* 15257 (F, US); del Valle, Pacific coast, Río Yurumanguí, *J. Cuatrecasas* 15948 (F, US);



Cordoba, wooded cliffs of Río Dagua, *E. Killip 5065* (GH, NY, US); Dagua Valley, *E. Killip 5266* (NY, US).

**II. *Dioclea* subg. *Platylobium*** (Benth.) R. H. Maxwell, comb. et stat. nov. Basionym: *Dioclea* sect. *Platylobium* Benth., Fl. Bras. [Martius] 15(1): 164. 1859. TYPE: *Dioclea bicolor* Benth., Comm. Legum. Gen. 69. 1837.

Lianas, woody vines, shrubs, and small vines of open areas; stipules small, to ca. 5 mm or not produced; floral bracts mostly small, to ca. 10 mm. Flowers with upper calyx lobe entire to emarginate; standard lamina apex entire to emarginate, bicallose to ecallose; stamens 10, anthers 5 perfect + 5 imperfect dimorphic, 5 perfect + 5 slightly smaller dimorphic, rarely 10 uniform (section *Macrocarpon*). Fruit dry, hard or coriaceous, elastic or weakly dehiscent, mostly flat, 2–5 mm thick (except *Dioclea macrocarpa* forms), upper suture with close parallel, shallow ribs to either side, lower margin flanged; 1- to 5-seeded; seeds flat, soft, rarely overgrown, 13–30 × 10–20 × 2–5 mm (unless overgrown), hilum elliptic or short-oblong, encircling < 1/6 the circumference of the seed (except linear in *D. huberi* to ca. 2 cm, encircling ca. 1/4–1/2 the circumference of the seed).

**IIa. *Dioclea* sect. *Platylobium*** Benth., Fl. Bras. [Martius] 15(1): 164. 1859.

Stout, high-climbing forest lianas, facultative vines of semi-wooded habitats, shrubs and small vines of open areas. Leaflets with primary lateral veins in 6 to 14 pairs; stipules not produced below insertion, usually minute, persistent or caducous; brachyblasts subsessile, clavate with stalks to 10 mm; floral bracts mostly small, lanceolate, 3–10 mm; bracteoles minute, ovate-cordate to flabellate. Flowers with the upper lobe of the calyx entire to slightly emarginate; standard lamina apex entire to emarginate, bicallose to ecallose, lower margin weakly biauriculate; wings obliquely oblong to obovate, without spurs; keel petals obliquely oblong, semi-lunar or semi-orbicular, the apices rostrate, obtuse, or narrowly truncate, upper margin entire, without a prominent lobe; stamens 10, vexillary anther and inner alternate anthers of the staminal sheath smaller, dimorphic to the rest, or rarely 10 uniform; style occasionally swollen or flat distally, stigma capitate. Legumes dry, hard or coriaceous, elastic or weakly dehiscent, ca. 2–5 mm thick, pubescent to glabrate, upper suture with close parallel, shallow ribs to either side, lower margin flanged, 1- to 5-seeded; seeds usually flat, somewhat orbicular, dark, soft, 13–30 × 10–20 × 2–

5 mm, hilum elliptic or short-oblong, encircling < 1/6 the circumference of the seed.

**1. *Dioclea hispidimarginata*** R. H. Maxwell, sp. nov. TYPE: Peru. Amazonas: Valle de Río Santiago, Caterpiza, 200 m, 27 Dec. 1979, V. Huashikat 1654 (holotype, MO; isotype, JEF). Figure 3.

Haec species *Diocleae huberi* Ducke similis, sed ab ea antheris dimorphis, vexillo apice pubescente, alis oblique oblongis auriculae ora hyalina et hilo oblongo differt.

Lianas, stems terete, twining, the older with raised circular lenticels, sparsely ferruginous pubescent. Leaves with leaflets papyraceous, obovate to suborbicular, 9–20 × 7–14 cm, adaxial lamina surface glabrous or glabrate, faintly reticulate, abaxial surface with appressed, short hairs, apices rounded with abrupt acuminate tips, tips ca. 1 cm, bases mostly rounded or somewhat truncate to slightly cordate, smaller leaflet bases cuneate, primary lateral veins in ca. 7 to 11 (to 13) pairs; petioles (4–)10–20 cm, rachis 2–4 cm, canaliculate, both with sparsely appressed to strigose, ferruginous pubescence, becoming glabrate; stipules not produced below insertion, linear-lanceolate, ca. 4–7 mm; stipels not seen. Inflorescences axillary, single, slender-terete, 35–80 cm, unbranched, with ferruginous to nigrescent pubescence, becoming glabrate, floriate 2/3–4/5 the length; brachyblasts clavate, subsessile or with short, ascending stalks, heads nigrescent, incurved, usually swollen; floral bracts linear-lanceolate, (3–)6–7 mm, semi-persistent, appressed ferruginous pubescent outside, glabrous inside; bracteoles ovate to flabellate, ca. 1.5 × 2 mm, persistent; pedicels 3–4 mm. Flowers 1.1–1.7 cm, buds with calyx lobes navicular or somewhat rounded; calyx tube dark outside, glabrate, villous inside, upper lobe strongly reflexed, obtuse, emarginate, ca. 6 × 3 mm, lateral lobes broadly acute, ca. 4 × 3 mm, lower lobe acute, ca. 5 × 3.5 mm; standard strongly reflexed, ovate or obovate, ca. 10 × 10–17 mm, claw ca. 4 mm, bicallose, apex ferruginous pubescent, with hairs 0.5–1 mm; wings obliquely oblong, ca. 8 × 5 mm, claw 5–6.5 mm, auricle with a prominent hyaline rim; keel petals obliquely oblong to somewhat U-shaped, to ca. 6 mm, rising distally 7–9 mm to an oblique, somewhat obtuse beak, or appearing truncate, claw ca. 5 mm, weakly auriculate; stamens 10, glabrous, pseudomonadelphous, anthers dimorphic, 5 + 5; pistil geniculate, ovary ca. 6 mm, subsessile, villous with white and ferruginous hairs, disc long-toothed, 2- to 4-ovulate; style rising distally ca. 7 mm, style proximally with a row of adaxial ferruginous hairs, ca. 1.5 mm, extending up the slightly flattened style,



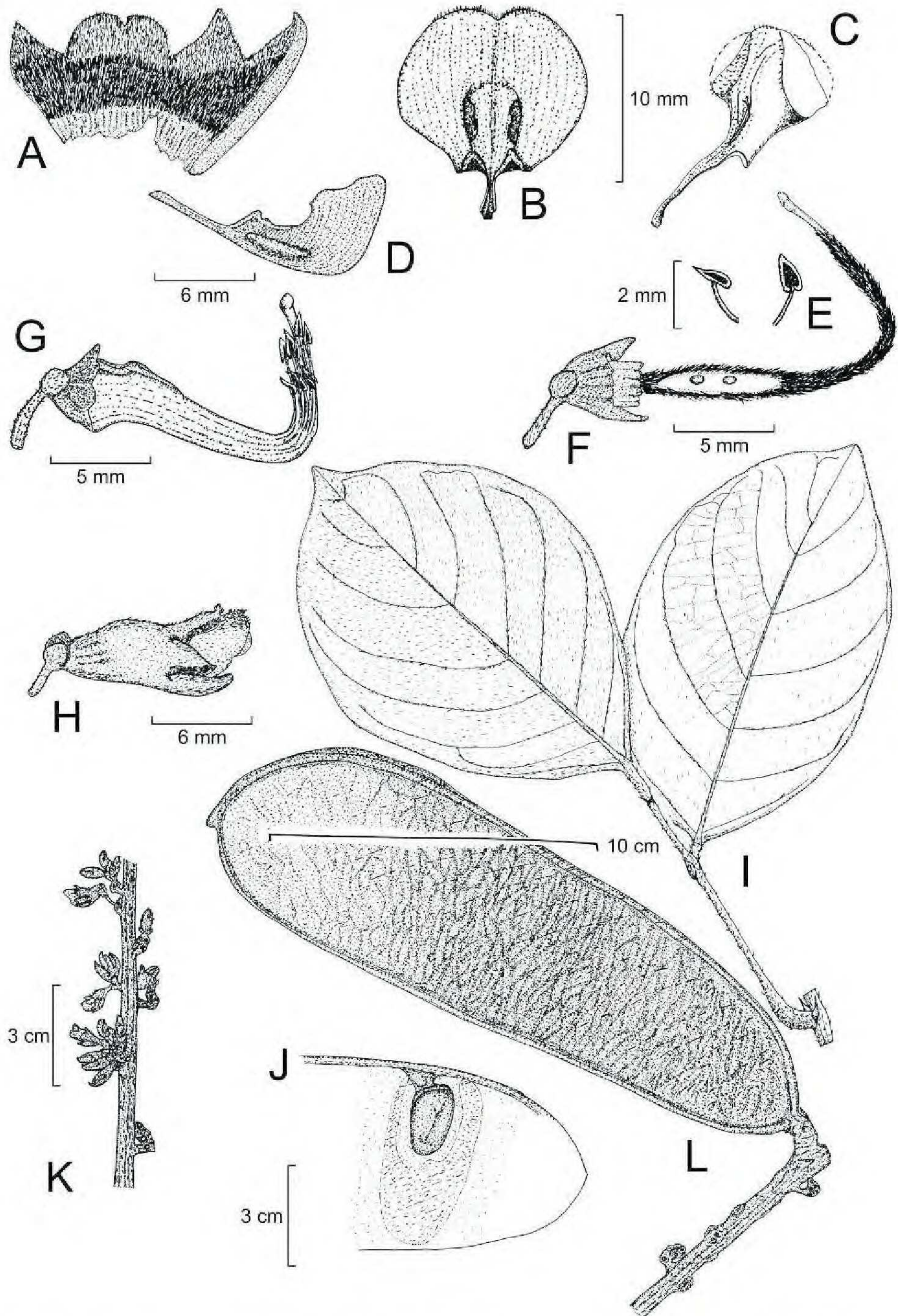


Figure 3. *Dioclea hispidimarginata* R. H. Maxwell. —A. Calyx, villous inner surface (6 mm scale). —B. Standard. —C. Wing petal. —D. Keel petal. —E. Dimorphic anthers. —F. Gynoecium, 2-ovulate, villous ovary with dentate disc below, with one bracteole attached to calyx remnant. —G. Androecium. —H. Flower bud. —I. Leaf showing terminal leaflet and one lateral leaflet, with one lateral leaflet missing. —J. Fruit outline, with developing seed. —K. Portion of inflorescence. —L. Fruit. A–H drawn from flower taken from the holotype *Huashikat* 1654 (MO); K from *Tunqui* 158 (MO); I, J, L from *Huashikat* 1827 (MO).



distally glabrous ca. 3 mm, stigma capitate. Fruit oblong to somewhat obovate, flat, dry, mostly oblong or somewhat wider distally, to ca.  $19 \times 4$  cm, ca. 6 cm wide distally, ca. 4 mm thick, weakly or tardily dehiscent, exocarp smooth (cracking?) with short, erect, ferruginous hairs, becoming glabrate, base rounded, apex rounded; upper margin culminating in a short, downcurved beak, the upper suture raised, with 2 close parallel ribs, lower margin appearing flanged, pedicel attachment median, 2- to 4-seeded; seeds immature, flat, probably soft, elliptic, the hilum oblong.

*Distribution, habitat, phenology, and common name.* Collections determined as *Dioclea hispidimarginata* have been found in Amazonas, Brazil; Amazonas and Loreto, Peru; and Putumayo, Colombia, at elevations from 100 to 200 m. Collectors report the flowers as violet (*Huashikat 1506*) or purple (*Tunqui 178*), flowering from November through January. The habitat has been reported as "monte virgen" (*Huashikat 1400; Tunqui 158, 178, 377*). Critical collections were made during the University of California Ethnobiological Expedition of 1979–1980. The common tribal name has been noted as "wapu naek" (*Huashikat 1506, 1654; Tunqui 158, 178, 377*).

*Discussion.* *Dioclea hispidimarginata* possesses long inflorescences with numerous dark flower buds on somewhat fleshy globose brachyblast heads. The new species is named for the apical marginal pubescence on the standard, an unusual character in *Dioclea* sect. *Platylobium*. *Dioclea hispidimarginata* differs from *D. huberi* (in section *Macrocarpon*) in possessing dimorphic anthers, in a 5 + 5 arrangement, rather than 10 uniformly presented anthers; seeds with the hilum oblong rather than linear, to ca. 2 cm; the standard pubescent, rather than glabrous; and the corolla wings obliquely oblong, the auricle with a hyaline rim rather than somewhat dwarf wing petals with thickened auricles. Based on additional collections from Brazil, Bentham (1859) moved his species *D. bicolor*, *D. rostrata* Benth., and *D. glabra* Benth. from *Dioclea* sect. *Pachylobium* (sensu 1837) to section *Platylobium*. Bentham's section *Platylobium* was characterized by stipules not extending below insertion, imperfect alternate anthers, few ovules, fruit wider and distally containing two or three seeds, and the seeds with the hilum short and oblong.

*Dioclea hispidimarginata* shares sectional characteristics with *D. bicolor* from central Brazil; *D. coriacea* Benth., from the Planalto, central Brazil; *D. ferruginea* Ducke from Pará, Brazil; and *D. scabra*

(Rich.) R. H. Maxwell from the Guianas, the Orinoco River region of Venezuela, and northern Brazil.

*Paratypes.* PERU. **Amazonas:** Río Santiago, vic. Caterpiza, 24 Nov. 1979, V. *Huashikat 1400* (JEF, MO); 65 km N of Pinglo, 17 Jan. 1980, V. *Huashikat 1827* (MO); Río Santiago, vic. Caterpiza, 28 Nov. 1979, S. *Tunqui 158* (MO), 29 Nov. 1979, S. *Tunqui 178* (JEF, MO), 20 Dec. 1979, S. *Tunqui 377* (MO).

**III. *Dioclea* sect. *Macrocarpon*** Amshoff, Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 52: 69. 1939. TYPE: *Dioclea macrocarpa* Huber, Bol. Mus. Paraense Hist. Nat. Ethngr. 5(2): 410–411. 1909 (lectotype, designated here).

*Discussion.* Although *Dioclea macrocarpa* and *D. huberi* have uniform anthers, several ovules, and somewhat similar wings as Bentham's section *Eudioeclea*, the shape of the keel petals, the upper keel margin configurations, and pods are distinct from the three sections described by Bentham (Amshoff, 1939: 69). Since 1939, *D. paniculata* Killip ex R. H. Maxwell (Maxwell, 1978), *D. steyermarkii* R. H. Maxwell (Maxwell, 1990b), and *D. ruddiae* R. H. Maxwell (Maxwell, 1988) have been tentatively assigned to section *Macrocarpon*. This section serves as a repository for *Dioclea* species with characters that do not fit comfortably into one of Bentham's three sections.

**III. *Dioclea* subg. *Pachylobium*** (Benth.) R. H. Maxwell, comb. et stat. nov. Basionym: *Dioclea* sect. *Pachylobium* Benth., Comm. Legum. Gen. 2: 68. 1837. TYPE: *Dioclea glabra* Benth. (lectotype, designated by Maxwell [1990a: 581]).

Mostly forest lianas, occasionally large coarse vines in open habitats climbing over smaller vegetation; leaflets with primary lateral veins in 8 to 12(to 18) pairs; stipules produced below insertion, large, to 3 cm (total length), rarely not produced or absent; floral bracts lanceolate, 6–14 mm, mostly caducous; bracteoles flabellate or ovate, small, 1–3(–5) mm (except oblanceolate, 5–8 mm in *Dioclea mollicoma* Ducke). Flowers with somewhat carnosose petals, glabrous; calyx with upper lobe emarginate; standard reflexed, apex emarginate, bicallose, biauriculate basally with small flaps folded upward and usually not extending down the claw; wings mostly obliquely oblong, frequently unequal, rarely with a spur; keel petals triangular, semi-orbicular, or semi-lunar, rising distally into a slender or obtuse beak, or the distal raised portion truncate, the upper margin entire, occasionally with a median lobe or sinuate; stamens mostly pseudomonadelphous, occasionally



the vexillary very lightly joined or rarely free, the free basal vexillary filament occasionally pubescent, anthers 10, dimorphic, 5 perfect + 5 imperfect dimorphic, or 6 perfect + 4 imperfect dimorphic, rarely 10 perfect uniform; pistils with the style usually proximally swollen, ovary disc dentate. Fruit various, flat, compressed or turgid, dehiscent, tardily dehiscent, or indehiscent, coriaceous, hard or soft-fleshy; upper margins various, upper suture raised with a rib or wing close to each side, without extra wings or ribs, margin flanged, sulcate, or indistinct; lower margin occasionally sulcate, mostly flanged, or indistinct, (1 to)2- to 9(to 11)-seeded; seeds various, if hard, compressed, oval, or suborbicular, smooth, to 20 mm thick, occasionally showing flat planes of contact, 6–20 mm thick; if soft-overgrown, to 40 mm thick, somewhat cuboidal-, barrel-, or cone-shaped, ca.  $3.5 \times 3.2 \times 1.8$  cm; hilum linear, 3.5–4 cm, encircling nearly 1/2–4/5 the circumference of the seed (some fruit are unknown).

**IIIa. *Dioclea* sect. *Pachylobium*** Benth., *Comm. Legum. Gen.* 2: 68. 1837. TYPE: *Dioclea glabra* Benth. (lectotype, designated by Maxwell [1990a: 581]).

Floral bracts 6–9 mm; keel petal upper margins usually with a median lobe. Fruit various; oblong, compressed, mostly hard, 4- to 10-seeded; seeds various, mostly hard, oval, frequently showing flat planes of contact, cottony or feltlike tissue frequently adhering to the seed, hilum oval or encircling ca. 1/2 the circumference of the seed; or fruit thick-lobed, cylindrical, fleshy, 1- to 5-seeded; seeds soft, overgrown; hilum linear, encircling ca. 1/2 the circumference of the seed.

**1. *Dioclea apiculata*** R. H. Maxwell, sp. nov. TYPE: Bolivia. La Paz: N Yungas, near Coroico, E of Lake Titicaca, 1100 m, Oct.–Nov. 1912, *O. Buchtien* 664 (holotype, MO; isotypes, F, G). Figure 4.

Haec species a congeneris *Diocleae* Kunth subg. *Pachylobii* (Benth.) R. H. Maxwell sect. *Pachylobii* Benth. stipulis lanceolatis usque ad 16 mm supra insertionem et fere 8 mm infra insertionem productis, foliolorum apice abrupte acuminato ca. 10 mm longo ac venis lateralibus primariis 10- ad 14-jugatis, alabastro apiculato, calycis lobo inferiore ceteros excedente, fructu trichomatibus velutinis ferrugineis vestito et seminibus (2 ad)5 vel 6(ad 8) cuneiformibus in substantia alba adhaerente inclusis hilo fere dimidium seminis circumferentiae cingente distinguitur.

Vines, high climbing, stems terete, pilose. Leaves with leaflets ovate-elliptic to broadly lanceolate, terminal leaflets to ca.  $20 \times 11$  cm, lateral leaflets

similar, adaxial lamina surface glabrous except the midrib, abaxial surface tomentose, apices abruptly acuminate, the tip to ca. 10 mm, terminal leaflet bases usually round to truncate, lateral leaflet bases round to slightly oblique; primary lateral veins in 10 to 14 pairs; petioles ca. 8–14 cm, rachis ca. 1/4 the petiole length; stipules lanceolate, persistent, to 16 mm distally, to 8 mm proximally, villose outside, glabrous inside; stipels acicular, to ca. 9 mm, ciliate. Inflorescences axillary or terminal, probably single and unbranched, to ca. 45 cm, florule length variable, < 1/2 to ca. the entire length, with fuscous pubescence; brachyblasts subsessile; floral bracts lanceolate, 7–9  $\times$  ca. 2 mm, ciliate outside, glabrous inside; bracteoles broadly ovate, ca. 3  $\times$  2 mm, ferruginous, velutinous outside, glabrous inside, somewhat persistent; bractlets narrowly rhombic, to ca. 3  $\times$  1.5 mm, ciliate outside; pedicels to ca. 10 mm. Flowers ca. 2.2 cm, buds with apiculate tips; calyx tube ca. 8 mm, ferruginous velutinous outside, fuscous velutinous inside, upper lobe emarginate, 7–9  $\times$  ca. 9 mm (width at base), lateral lobes falcate, ca. 7  $\times$  4 mm, ciliate, lower lobe upcurved, ca. 10  $\times$  5 mm; standard broadly orbicular, emarginate, ca. 18  $\times$  19 mm, claw ca. 4 mm; wings somewhat square to obliquely oblong, equal, with the distal lower margin broadly crenulate, 13–15  $\times$  ca. 10 mm, claw ca. 7 mm; keel petals triangulate, auriculate, ca. 15 mm, rising distally ca. 12 mm culminating in a narrow beak, upper margin with a prominent median lobe, claw ca. 7 mm; stamens 10, vexillary filament short with imperfect anther, 5 perfect anthers on ca. 6 mm filaments, 4 imperfect anthers on ca. 1 mm filaments alternating with the perfect anthers; pistil with the ovary slightly downcurved then geniculate, rising ca. 10 mm, style glabrous distally ca. 6 mm; ovary ca. 7 mm, substipitate, villous with white hairs to 3 mm, disc dentate, ca. 6-ovulate; stigma terminal, capitate. Fruit dry, compressed, oblong to oblong-elliptic, to ca. 10  $\times$  2.5  $\times$  1.3 cm, indehiscent?, with ferruginous velutinous, stinging or nonstinging hairs, upper suture with parallel ribs, downcurved beak, lower suture becoming sulcate, (2 to)5- or 6(to 8)-seeded; seeds ovate to wedge-shaped, ca. 19  $\times$  11  $\times$  6 mm, enclosed in adherent white feltlike tissue, hilum linear, ca. 11–18 mm, encircling ca. 1/2 the circumference of the seed.

*Distribution, habitat, and phenology.* *Dioclea apiculata* has been found in Bolivia and collections have been determined for this species from Peru. This new species has been found in mountain forests at altitudes from 1100 to 2440 m on the eastern slopes of the Andes and observed to flower from October through February.



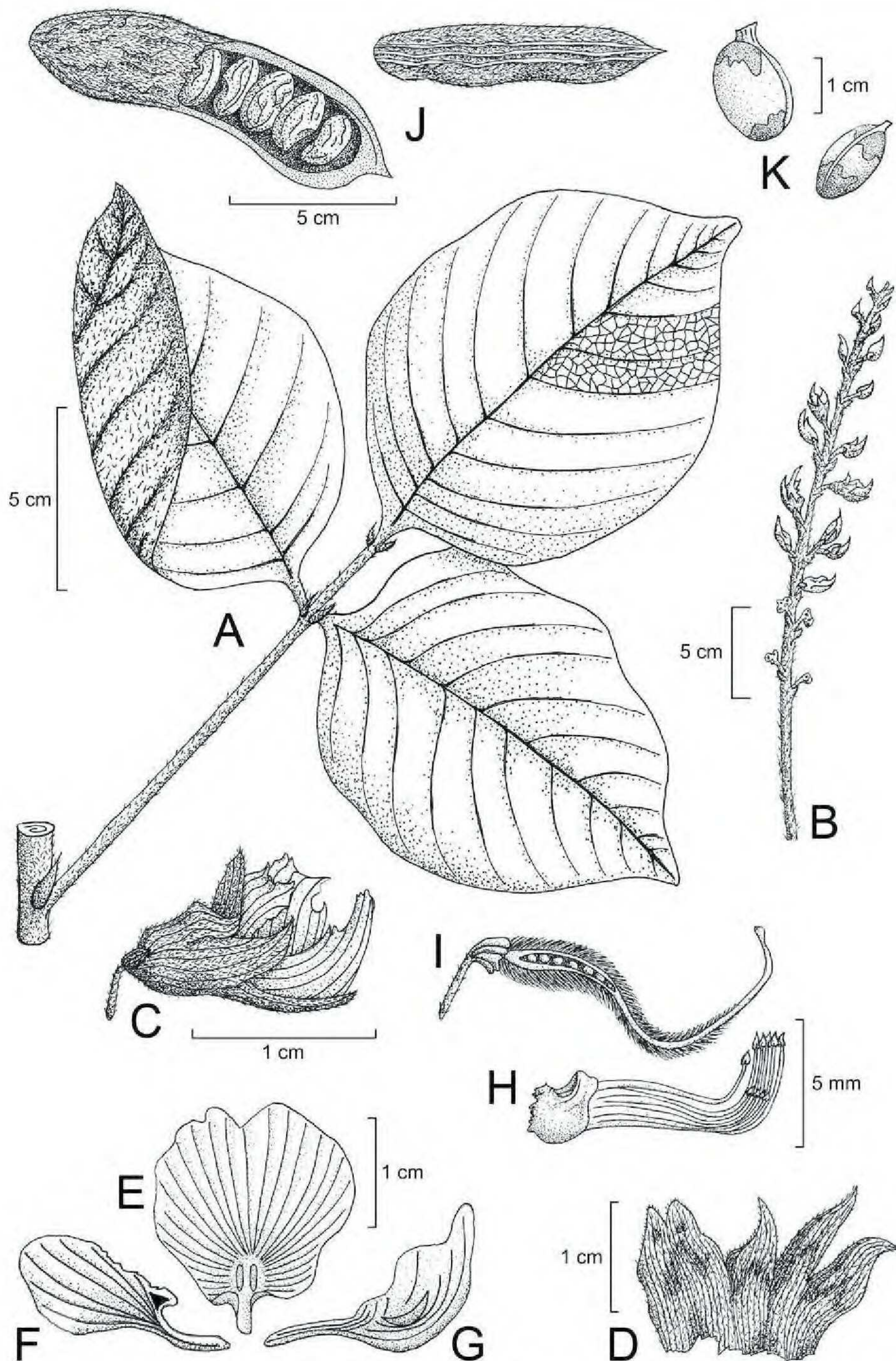


Figure 4. *Dioclea apiculata* R. H. Maxwell. —A. Leaf. —B. Portion of inflorescence. —C. Flower bud. —D. Calyx, inner surface. —E. Standard. —F. Wing petal. —G. Keel petal. —H. Androecium. —I. Gynoecium. —J. Fruit, dissected side view (at left) and upper suture view (at right). —K. Seeds showing hilum encircling nearly half the seed circumference. A–I drawn from the holotype *O. Buchtien 664* (F); J, K from the paratype *J. C. Solomon 9210* (MO).



**Discussion.** Flower color is reported from collectors as pale blue (*Solomon 9210*, MO), white-lilac (*Beck & Foster 13955*, NY), purple above and white below (*Besse et al. 1793*, MO), and purple (*Lewis 37925*, MO). The lower lobe of the calyx in flower buds protrudes upward, forming an apiculate tip. The fruits of *Solomon 9210* (MO) are covered with dark brown, stinging hairs. The immature fruit of *Besse et al. 1793* (MO) shows a similar shape and pubescence as those of *Solomon 9210* (MO), but the collector does not report stinging hairs. In *Dioclea* subg. *Pachylobium*, a variety of fruit and seeds exist. In *D. apiculata*, *D. sclerocarpa* Ducke, and *D. glabra*, seeds develop from soft to hard, but seed crowding early in pod development usually results in flat planes on the final hard seed nesting in thin or feltlike packing tissue. Species with somewhat similar seeds but larger fruit known to lack stinging hairs include *D. glabra*, from eastern and northeastern Brazil; *D. grandiflora* Mart. ex Benth., from caatinga in northeastern Brazil; and *D. sclerocarpa*, from northeastern Brazil.

**Paratypes.** BOLIVIA. **La Paz:** Murillo, Cahua, mtn. forest, mostly evergreen, 30 Oct. 1988, *S. G. Beck & R. Foster 13955* (NY); along Yalisa, 5 Nov. 1990, *M. Lewis 37925* (JEF, MO); Murillo, mostly montane evergreen forest, Unduavi, 1885, *H. Rusby 2397* (NY); Murillo, below dam at Lago Zongo, 19 Dec. 1982, *J. Solomon 9210* (MO); Nor Yungas, near Charocamba, 13 Feb. 1956, *E. de la Sota 632* (SI).

**2. *Dioclea circinata*** R. H. Maxwell, sp. nov. TYPE: Colombia. Meta: Camp 1, El Mico Airstrip, dense, humid forest, 450 m, 13 Nov. 1949, *W. R. Philipson, J. M. Idrobo & A. Fernandez 1405* (holotype, COL; isotypes, BM, S, US). Figure 5.

Haec species *Diocleae megacarpae* Rolfe similis, sed ab ea bracteis usque ad 7 mm tantum longis, carinae petalis longirostribus atque stylo gracili distinguitur.

Large lianas, woody climbers, stems terete, with appressed pubescence. Leaves with leaflets coriaceous, broadly ovate, terminal leaflet to ca. 18 × 11 cm, lateral leaflets to 11–16 × 7.5–11 cm, adaxial lamina surface slightly to distinctly rugose, glabrous, abaxial surface reticulate, strigose, along from the veinlets, apices obtuse or apiculate, bases rounded to slightly oblique, primary lateral veins in 9 to 13 pairs; petioles and rachis canaliculate, petioles 8.4–15.2 cm, rachis 2–5 cm, with fulvous appressed pubescence; stipules lanceolate, produced to ca. 5 mm distally, < 5 mm proximally; stipels setiform, ca. 3 mm, pubescent. Inflorescences axillary, solitary at axis, with a coiling tendency, 30–45 cm, floriate

almost to the base; brachyblasts clavate, short-stalked, heads incurved; floral bracts linear-lanceolate, to ca. 7 mm, appressed pubescent and ciliate outside, puberulent inside, caducous; bracteoles broadly flabellate, ca. 2 × 2.5–4 mm, caducous; bractlets similar to the bracteoles; pedicels ca. 5 mm. Flowers ca. 25 mm, buds with calyx lobes upcurved; calyx sparsely pubescent, tube ca. 10 mm, upper lobe broadly oblong, apex truncate, or slightly emarginate, ca. 8 × 10 mm, lateral lobes lanceolate-falcate, 7–10 × 4–5 mm, lower lobe lanceolate, to 11–13 × ca. 6 mm; standard broadly ovate, ca. 20 × 16–24 mm, bicallose, claw ca. 4 mm; wings free from the keel petals, lower lamina interlocked with each other under the keel petals in the bud, triangular to obliquely oblong, 16–23 × 9–13 mm, claw ca. 6 mm; keel petals triangular to semi-lunar, ca. 13 mm, rising distally ca. 12 mm to a narrow beak, weakly auriculate basally, upper margin with a prominent median lobe, claw ca. 5.5 mm; stamens 10, pseudomonadelphous, vexillary filament free basally ca. 3 mm, pubescent; anthers dimorphic, 5 perfect + 5 imperfect; pistil straight 17–20 mm, rising distally ca. 13 mm, style glabrous distally ca. 6 mm; ovary ca. 6 mm, short-stipitate, with rigid white hairs ca. 2.5 mm, disc dentate, ca. 5-ovulate; stigma terminal, capitate. Fruit unknown.

**Distribution, habitat, phenology, and etymology.** The holotype and paratype collections of *Dioclea circinata* are from Meta, Colombia. Both are from dense humid forests in the Serranía de La Macarena region, at 450–500 m in altitude. Both collection labels note the flowers as lilac, with flowering from November through January. The species epithet, *circinata*, refers to the coiling tendency of the inflorescences as they develop.

**Discussion.** The collectors of the holotype (*W. R. Philipson et al. 1405*, COL) note the sap as drinkable. The collectors of the paratype (*Philipson & Idrobo 1996*, BM, COL, US) note a red stain under the bark and note the common name of “bejuco de agua.” Both type collections were originally determined as *Dioclea megacarpa* Rolfe, but the collections differ from that species by the keel petals with slender beaks (vs. truncate in *D. megacarpa*), floral bracts to ca. 7 mm long (vs. to ca. 20 mm). Maxwell (1969: 165) described this taxon as a new variety under *D. malacocarpa* Ducke, expecting the fruit, when found, to be turgid with overgrown seeds (Corner, 1951: 141; Kirkbride et al., 2003: 18). However, because of the many different types of fruit in *Dioclea*, fruit, when found, could also be similar to that of *D. apiculata*, which would place the new species in that species



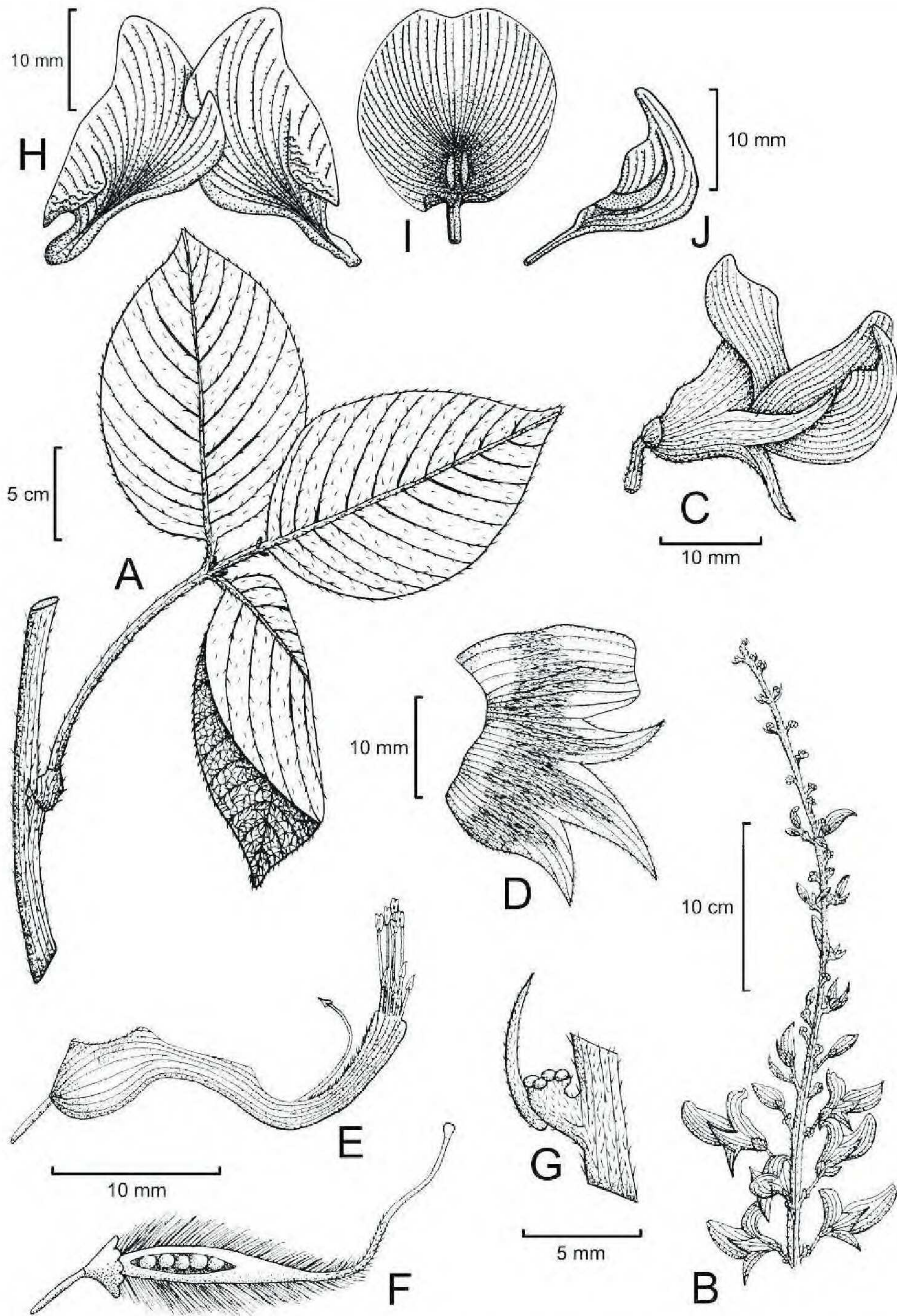


Figure 5. *Dioclea circinata* R. H. Maxwell. —A. Leaf. —B. Portion of inflorescence. —C. Flower. —D. Calyx, inner surface. —E. Androecium. —F. Gynoecium. —G. Portion of inflorescence, brachyblast with floral bract. —H. Interlocked wing petals. —I. Standard. —J. Keel petal. A drawn from Philipson & Idrobo 1996 (BM); B–J from the type Philipson, Idrobo & Fernandez 1405 (BM, COL, S).



group with somewhat similar fruit. If the fruit is turgid with soft, overgrown seeds, placement would be with similar species in *Dioclea* subg. *Pachylobium*, such as *D. malacocarpa* and *D. haughtii* (Fig. 6).

*Paratype.* COLOMBIA. **Meta:** Sierra de La Macarena, Caño Entrada, 29 Dec. 1949, *W. R. Philipson & J. M. Idrobo 1996* (BM, COL, US).

**3. *Dioclea haughtii*** R. H. Maxwell, sp. nov. TYPE: Colombia. **Meta:** Los Llanos, Río Humea, at Puerto Sanchez, 7 Feb. 1939, *O. Haught 2583* (holotype, COL; isotypes, GH, RB p.p. [excl. seeds], S, US, VEN). Figure 6.

Haec species *Diocleae malacocarphae* Ducke fructu turgido et seminibus magnis mollibusque similis, sed ab ea carinae rostro cucullato atque fructus trichomatibus urentibus differt.

Lianas, stems terete, substrigose. Leaves with leaflets ovate to ovate-elliptic, terminal leaflets ca.  $12 \times 8$  cm, lateral leaflets ca.  $12 \times 7.5$  cm, adaxial lamina surface glabrescent, except the midrib pubescent, somewhat rugose, abaxial surface densely sericeous, apices abruptly acute, terminal leaflet bases truncate or round, lateral leaflet bases oblique, primary lateral veins in 9 to 12 pairs; petioles 11–14 cm, rachis ca. 1.5 cm, both densely substrigose; stipules produced below insertion, ca. 1.5 cm, persistent; stipels subulate, ca. 4 mm, persistent. Inflorescences axillary, single, unbranched, to 40 cm, pubescent; brachyblasts clavate, with a stalk ca. 1 mm; floral bracts unknown; bracteoles slightly flabellate, ca.  $1.5 \times 2$  mm, persistent, ferruginous pubescent outside, glabrous inside; pedicels ca. 6 mm. Flowers ca. 1.5 cm, flower buds straight, slightly globose; calyx tube ca. 6.5 mm, fuscous pubescent outside, irregularly velutinous inside, striations evident, calyx lobes blunt, upper lobe emarginate, obtuse, ca.  $4 \times 4$  mm basally, lateral lobes acute, slightly falcate, ca.  $4 \times 3$  mm, lower lobe upcurved, broadly lanceolate, ca.  $5 \times 3.5$  mm; standard obovate-orbicular, red-purple, ca.  $11 \times 10$  mm, claw ca.  $3 \times 2$  mm; wings obliquely oblong, to  $7\text{--}10 \times 4\text{--}6$  mm, claw ca. 5 mm; keel petals semi-lunar, ca. 7 mm, rising distally ca. 9 mm, culminating in a hooded beak, upper margin basally rounded or weakly auriculate, with a prominent median lobe, claw ca. 4 mm; stamens 10, anthers 5 perfect + 5 imperfect, fertile anthers < 1 mm, vexillary filament free at the base ca. 2 mm, pubescent; pistil somewhat straight ca. 10–12 mm, then geniculate ca. 7–9 mm, style proximally slightly thickened, sparsely ciliate, style distally bent back, glabrous ca. 2 mm; ovary ca. 5 mm, villous with canescent or fuscous hairs 1.5–2

mm, ca. 2- to 4(to 5)-ovulate, disc dentate. Fruit [known only from the paratype, *Davidse & González 16,219* (MO)] turgid, oblong, straight,  $9.5\text{--}15 \times 4.5\text{--}5 \times 4\text{--}5$  cm, presumed indehiscent, wrinkled with detached stinging hairs, upper and lower sutures indistinct, lacking ribs or wings, 2- to 4(to 5)-seeded; seeds soft, overgrown, cuboidal, cone-shaped or barrel-shaped, showing flat planes of contact, ca.  $4.5 \times 2.4\text{--}4 \times 4$  cm, the hilum linear-oblong, ca. 7 cm, encircling ca. 1/2 the circumference of the seed.

*Distribution, habitat, and etymology.* The holotype collection (*Haught 2583*, COL) noted the specimen as a rather slender liana with showy, inodorous reddish purple flowers collected in the forest along the Río Humea at Puerto Sanchez, in Meta, Colombia. The species is named after Oscar Haught, a knowledgeable collector of the Ecuadorian and Peruvian flora.

*Discussion.* The paratype collection *Davidse & González 16,219* (JEF, MO) noted that the specimen was a large liana in a deciduous gallery forest, ca. 19 airline km SW of Elorza, Apure, Venezuela. Also noted was the “[l]arge liana; fruit green covered with irritating brown hairs; seeds used to make flour for arepas, . . . common name ‘chocha.’” The RB isotype is, I believe, a mixture; the seeds do not belong. Because of the many types of fruit among the large lianas of *Dioclea* s.l., there is always a risk in assigning fruit-only collections to flower-only collections, but the two type collections otherwise correspond. In the transition of fruit and seeds in *Dioclea* s.l., one type includes those species producing seeds that remain soft, swelling to fill the indehiscent, turgid pod, with an increase in the thickness of packing tissue around the seeds (Fig. 6J, K). These are overgrown fruit and some parts may be edible. Species within this subgenus group with such known overgrown seeds include *D. aurea* R. H. Maxwell from Panama and Colombia, *D. edulis* Kuhl. from eastern Brazil, *D. malacocarpa* from central and northern South America, *D. pulchra* Moldenke from Colombia and extending into Central America, *D. rufescens* Benth. from eastern Brazil, and *D. ucayalina* Harms from Colombia, Ecuador, and Peru.

*Paratype.* VENEZUELA. **Apure:** Dist. Rómulo Gallegos, Caño Caribe, 90 m, 8 Mar. 1979, *G. Davidse & A. C. González 16,219* (JEF, MO).

**4. *Dioclea jamesonii*** R. H. Maxwell, sp. nov. TYPE: Ecuador. “Collectio Reichenbach fil., Acqu. 1889,” *W. Jameson s.n.* (holotype, W 125398; isotype, W 125301). Figure 7.



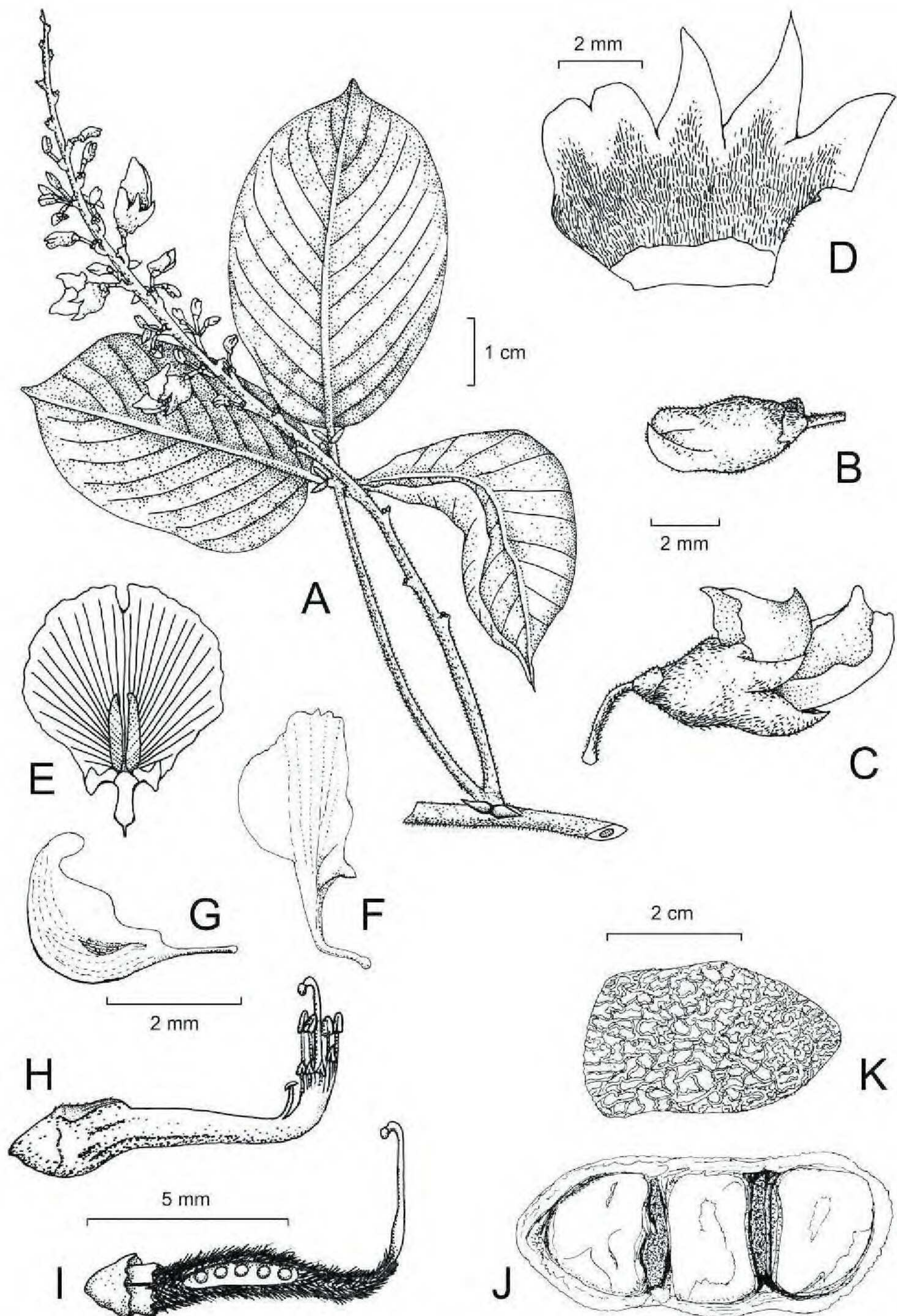


Figure 6. *Dioclea haughtii* R. H. Maxwell. —A. Habit with leaf, inflorescence, and piece of stem showing stipule produced below insertion. —B. Flower bud. —C. Flower. —D. Calyx, inner surface. —E. Standard. —F. Wing petal. —G. Keel petal. —H. Androecium. —I. Gynoecium, ovary with dentate disc. —J. Three-seeded fruit with overgrown seeds sliced in half. —K. Turgid fruit, wrinkled piece of exocarp. A–I drawn from the holotype *O. Haught* 2583 (COL); J, K from the paratype *G. Davidse & González* 16,219 (MO).



Haec species *Diocleae mollicomae* Ducke pubescentia argentea sericea in pagina inferiore laminarum foliolorum similis, sed ab ea foliolorum venis lateralibus primariis 9-jugatis, bracteolis late ovatis usque flabellatis ca.  $3 \times 3$  mm, ovario 4- vel 5-ovulato et seminibus minoribus differt.

Lianas, stems terete, fulvous, pilose. Leaves with leaflets somewhat coriaceous, broadly ovate, ca. 13–15  $\times$  8–10 cm, lateral leaflets slightly oblique, adaxial lamina surface dark, slightly rugose, glabrescent, except pubescent along the midrib, abaxial surface argenteous sericeous, apices obtuse or with an acumen ca. 5 mm, or abruptly acute, bases rounded to slightly cordate, primary lateral veins in ca. 9 pairs; petioles ca. 6–9 cm, rachis ca. 1.5–2.5 cm, tomentose; stipules lanceolate, 7–8(–10) mm distally, 3–5(–9) mm proximally, densely pubescent outside; stipels filamentous, ca. 4 mm. Inflorescences terminal, axillary, single, unbranched, ca. 39 cm, florule  $< 1/2$ – $2/3$  the length; brachyblasts subsessile; floral bracts broadly lanceolate, ca.  $8 \times 2$  mm, pubescent on both sides; bracteoles broadly ovate to flabellate, ca.  $3 \times 3$  mm, pale ferruginous outside, glabrous inside, persistent; bractlets ca.  $2 \times 1$  mm; pedicels ca. 4 mm. Flowers ca. 1.6 cm, buds straight; calyx tube ca. 7 mm, ferruginous, upper lobe emarginate, obtuse, ca.  $3.5 \times 6.5$  mm, lateral lobes acute, slightly falcate, ca.  $4 \times 3$  mm, lower lobe lanceolate, ca.  $5 \times 3.5$  mm [insect damaged]; standard [partially missing in the type] reflexed, broadly obovate, ca.  $10 \times 12$  mm, apex emarginate, bicallose, biauriculate, claw ca. 3.5 mm; wings obliquely oblong to obovate, ca.  $8 \times 6$  mm, auricle sharp, without a spur, claw ca. 4 mm; keel petals broadly falcate, ca. 5 mm, rising distally ca. 8 mm, beaked [truncate or insect damaged?], upper margin auriculate at the base, with a weak supra-median lobe or lacking a median lobe, claw ca. 4 mm; stamens 10, pseudomonadelphous, vexillary stamen free at the base ca. 3 mm, glabrous, anthers 5 perfect + 5 imperfect; pistil slightly downcurved ca. 11 mm, then upcurved ca. 7 mm, style bulbous, proximally villous, distally glabrous 2–5 mm, ovary ca. 5 mm, substipitate, with dense white hairs to 1 mm, disc condition unknown, 4- or 5-ovulate; stigma terminal, capitate. Fruit compressed, 3-seeded, oblong-elliptic, ca.  $15 \times 6 \times 1.4$  cm; 1-seeded, somewhat oval, ca.  $8.5 \times 6 \times 1.4$  cm; indehiscent or partially dehiscent at the lower margin; exocarp with sparse, appressed, ferruginous pubescence to glabrescent; upper suture indistinct, the margin flat, with edges extending into wings, lower fruit margin flanged, 1- to 5-seeded; seeds hard, oval, ca.  $31 \times 25 \times 18$  mm, dark brown with a piece of woody raphe persistent; hilum linear, ca. 6 cm, encircling ca.  $3/4$  the circumference of the seed.

*Distribution and habitat.* *Dioclea jamesonii* was found in Ecuador. The paratype collectors *Dodson & Thien 1200* (MO) noted the specimen as lianas collected at 350 m in northern Ecuador with the flowers blue and white. In contrast, the paratype collectors *Andre 4149* (K) noted the flowers as azure-lilac, from the central mountains at ca. 2200 m in southern Ecuador.

*Discussion.* The new species is named after William Jameson, who lived, collected, and taught in Ecuador from 1822 to 1869 (Jørgensen, 1999). *Dioclea jamesonii* shares the distinctive white pubescence on the abaxial leaflet surface with *D. mollicoma* Ducke, but has fewer primary lateral vein pairs (nine vs. 12 to 15 in *D. mollicoma*), bracteoles widely ovate to flabellate and ca.  $3 \times 3$  mm (vs. oblanceolate and ca. 5–8 mm long), smaller seeds to 31 mm long (vs. to 42 mm long). Ovaries are 4- or 5-ovulate in *D. jamesonii* rather than 2-ovulate in *D. mollicoma* in those collections examined for both species. Other species with fruit and seeds similar to *D. jamesonii* (Fig. 7I, J) include *D. densiflora* Huber from Brazil; *D. javanica* Benth. from Asia; *D. mollicoma* from Brazil, Peru, and ranging to the West Indies and Dominica; *D. umbrina* Elmer from the Philippines; *D. wilsonii* from the New World tropics; and *D. reflexa* from Africa and the Asian tropics.

*Paratypes.* ECUADOR. **Loja:** betw. Río Camba & Loja city, July 1876, *E. André 4196* (K); Los Ríos, Jauneche forest, fruits black, in swamp, 24 Jan. 1981 (fr.), *A. Gentry, C. Bonifaz, J. Loo & R. Lao 30736* (MO); Prov. Pichincha, vine along Río Baba, S of Santo Domingo, 3 Nov. 1961, *C. Dodson & L. Thien 1200* (MO).

*Acknowledgments.* Robert H. Mohlenbrock (SIU, Carbondale) contributed the original Latin descriptions for new sections and species (Maxwell, 1969). The Latin descriptions have been modified for publication in *Novon* by Mark A. Garland and Roy Gereau (MO). Inflorescence and floral details are from dissection sketches by the author. Preliminary pen-and-ink drawings were done by students in the Art Department of Southern Illinois University at Carbondale during 1970–1974 and enhanced by Kathryn Duffy. Illustrations of *Dioclea ovalis*, *D. vallensis*, *D. apiculata*, and *D. circinata* are by Kathryn Duffy. Illustrations of *D. hispidimarginata*, *D. haughtii*, and *D. jamesonii* are by Freda Burton (SIU), additions or modifications are by Duffy and/or the author. *Dioclea* was suggested as a revision project for the Ph.D. by John D. Dwyer (1915–2005) (St. Louis University and MO), when the author was a



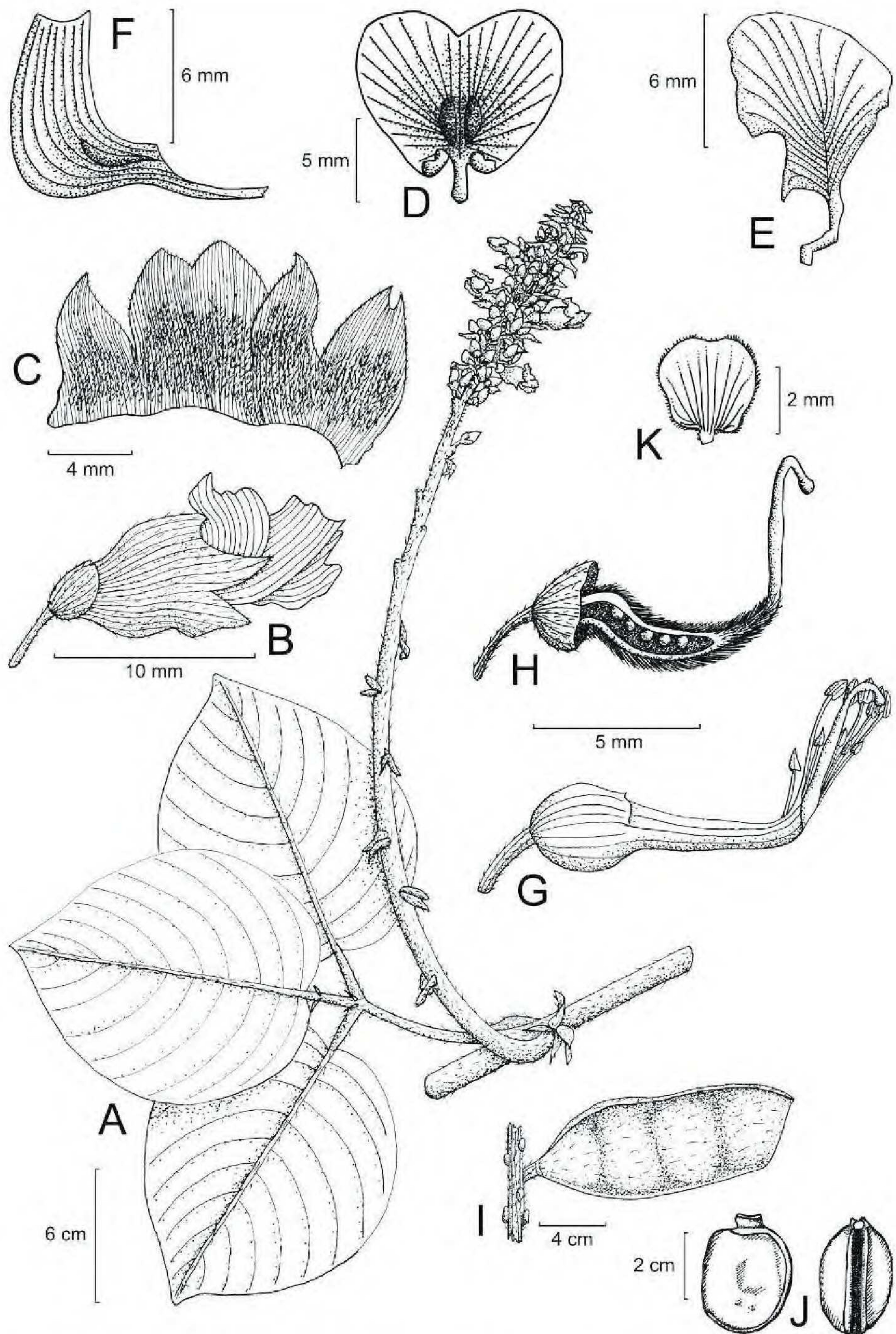


Figure 7. *Dioclea jamesonii* R. H. Maxwell. —A. Habit with leaf, inflorescence, and piece of stem, showing produced stipules. —B. Flower bud with bracteole. —C. Calyx, inner surface (lower lobe showing insect damage). —D. Standard. —E. Wing petal. —F. Keel petal (apex insect damaged). —G. Androecium. —H. Gynoecium. —I. Fruit. —J. Seeds, hilum view (at right) and side view (at left). —K. Bracteole, inner surface. A–C, E–H, K drawn from the type *Jameson s.n.* (W); D from the paratype *Dodson & Thien 1200* (MO); I, J from the paratype *Gentry et al. 30736* (MO).



participant in a National Science Foundation Academic Year Institute Fellowship at Washington University in St. Louis, 1963–1964. I appreciated guidance and encouragement from Robert Mohlenbrock, my major professor (SIU); Howard S. Irwin (1928–, NY); and Velva Rudd (1910–1999, US) during my early studies. I also acknowledge the opportunity to work at the Missouri Botanical Garden as an assistant curator (postdoctoral) with the guidance of Walter Lewis, from September to January 1969 and May to September 1970. I thank the Smithsonian Institution for assistance with travel and residence in Sri Lanka in the summer of 1972 for fieldwork on the legume tribe Phaseoleae (Maxwell, 1991). I also thank the curators and directors of the following selected herbaria for their hospitality during visits and/or providing loans pertaining to my studies: A, BISH, BM, BR, BRG, C, COL, F, G, GH, GOET, IAN, IBGE, K, LE, LIL, M, MG, MO, NY, P, PDA, PH, RB, S, SIU, SP, TRIN, U, UC, US, VEN, and W. Finally, without the assistance of David W. Taylor (JEF), I would not have been able to finish this manuscript.

#### Literature Cited

- Amshoff, G. J. H. 1939. On South American Papilionaceae. *Meded. Bot. Mus. Herb. Rijks Univ. Utrecht* 52: 69.
- Bentham, G. 1837. *Dioclea* Kunth. Pp. 68–70 in *Commentationes de Leguminosarum Generibus*. Sollinger, Vienna.
- Bentham, G. 1839. *De Leguminosarum Generibus Commentationes*. *Ann. Wiener Mus.* 2: 61–142.
- Bentham, G. 1859. Papilionaceae. Pp. 160–167 in C. F. P. Martius (editor), *Flora Brasiliensis* 15(1). R. Oldenbourg, Leipzig.
- Britton, N. L. & P. Wilson. 1924. Botany of Porto Rico and the Virgin Islands, Vol. 5(3): 418. New York Academy of Sciences, New York.
- Corner, E. J. H. 1951. The leguminous seed. *Phytomorphology* 1: 117–150.
- Gunn, C. R. 1968. Stranded seeds and fruits from the southeastern shore of Florida. *Gard. J. New York Bot. Gard.* 18(2): 43–54.
- Gunn, C. R., J. V. Dennis & P. Paradine. 1976. *World Guide to Tropical Drift Seeds and Fruits*. Quadrangle/The New York Times Book Co., New York.
- Jørgensen, P. M. 1999. History of collecting. Pp. 25–41 in P. M. Jørgensen & S. León-Yáñez (editors), *Catalogue of the Vascular Plants of Ecuador*. *Monogr. Syst. Bot. Missouri Bot. Gard.* 75.
- Kavanagh, T. A. & I. K. Ferguson. 1981. Pollen morphology and taxonomy of the subtribe Diocleinae (Leguminosae: Papilionoideae: Phaseoleae). *Rev. Palaeobot. Palynol.* 32: 317–367.
- Kirkbride, J. H., C. R. Gunn Jr. & A. L. Weitzman. 2003. *Cymbosema*. Pp. 482–483 in *Fruits and Seeds of Genera in the Subfamily Faboideae (Fabaceae) I*: 18. U.S. Department of Agriculture Technical Bulletin 1890. U.S. Department of Agriculture, Beltsville, Maryland.
- Lackey, J. A. 1981. Tribe 10, Phaseoleae. Pp. 301–327 in R. M. Polhill & P. H. Raven (editors), *Advances in Legume Systematics, Part I*. Royal Botanic Gardens, Kew, Richmond.
- Maxwell, R. H. 1969. The Genus *Dioclea* (Fabaceae) in the New World. Ph.D. Thesis, Southern Illinois University at Carbondale, Carbondale.
- Maxwell, R. H. 1970. The genus *Cymbosema* (Leguminosae): Notes and distribution. *Ann. Missouri Bot. Gard.* 57: 252–257.
- Maxwell, R. H. 1978. Problems in the placement of *Dioclea paniculata* Killip ms. (Leguminosae). *Phytologia* 40: 243–252.
- Maxwell, R. H. 1988. A new species of *Dioclea* Kunth (Diocleinae, Fabaceae) from the Venezuelan Guayana. *Ann. Missouri Bot. Gard.* 75: 730–732.
- Maxwell, R. H. 1990a. A new combination in *Dioclea* Kunth (Fabaceae–Diocleinae) from the clarification of *D. glabra* Benth., *Flora Brasiliensis*. *Ann. Missouri Bot. Gard.* 77: 578–583.
- Maxwell, R. H. 1990b. New taxa of *Dioclea* Kunth (Fabaceae–Diocleinae) from the Venezuelan Guayana. *Ann. Missouri Bot. Gard.* 77: 584–587.
- Maxwell, R. H. 1991. Phaseoleae. Pp. 236–381 in M. D. Dassanayake & F. R. Fosberg (editors), *A Revised Handbook to the Flora of Ceylon VII*. Amerind Publishing Co., New Delhi.
- Maxwell, R. H. 1999. *Cymbosema*. Pp. 294–295 in J. A. Steyermark, P. E. Berry, K. Yatskievych & B. K. Holst (editors), *Flora of the Venezuelan Guayana*, Vol. 5. Missouri Botanical Garden Press, St. Louis.
- Maxwell, R. H. & D. W. Taylor. 2003. Phylogenetic relationships of the Diocleinae with particular emphasis on the subgroups of *Dioclea*. Pp. 325–353 in B. B. Klitgaard & A. Bruneau (editors), *Advances in Legume Systematics, Part 10, Higher Level Systematics*. Royal Botanic Gardens, Kew, Richmond.
- Muir, J. 1937. *The Seed Drift of South Africa, and Some Influences of Ocean Currents on the Strand Vegetation*. Botanical Survey Memoir No. 16. Department of Agriculture and Forestry, Government Printer, Pretoria.
- Queiroz, L. P. de, R. H. Fortunato & A. M. Giuliatti. 2003. Phylogeny of the Diocleinae (Papilionoideae: Phaseoleae) based on morphological characters. Pp. 303–324 in B. B. Klitgaard & A. Bruneau (editors), *Advances in Legume Systematics, Part 10, Higher Level Systematics*. Royal Botanic Gardens, Kew, Richmond.
- Smith, J. E. 1793. *Platylobium* Sm. P. 17 in *A Specimen of the Botany of New Holland*, Vol. 1. J. Sowerby, London.
- Svenson, H. K. 1946. Vegetation of the coast of Ecuador and Peru and its relation to the Galapagos Islands. I. Geographical relations of the Flora. *Amer. J. Bot.* 33(5): 394–426.
- Tucker, S. C. 1987. Pseudoracemes in papilionoid legumes: Their nature, development, and variation. *J. Linn. Soc., Bot.* 95: 181–206.
- Varela, E. S., J. P. M. S. Lima, A. S. Galdina, L. D. S. Pinto, W. M. Bezerra, E. P. Nunes, M. A. O. Alves & T. B. Grangeiro. 2004. Relationships in subtribe Diocleinae (Leguminosae: Papilionoideae) inferred from internal transcribed spacer sequences from nuclear ribosomal DNA. *Phytochemistry* 65: 59–69.
- Zamora, N. 2000. Nuevas especies y combinaciones en Leguminosas de Mesoamerica. *Novon* 10: 175–180.